

PATENT SPECIFICATION

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PROVISIONAL SPECIFICATION

Means for Terminating or Tuning a Concentric Electrical Line

We, ROBERT BULLOCH PHILLIPS, of Admiralty Signal Establishment Extension, Wills Physics Laboratory, Royal Fort, Bristol, 8, and CHARLES SEYMOUR WRIGHT, C.B., O.B.E., M.C., M.A., Director of Scientific Research, Admiralty, London, S.W.1, both of British Nationality, do hereby declare the nature of this invention to be as follows:—

This invention relates to concentric lines for the transmission of ultra-high-frequency electromagnetic energy and one object of the invention is to provide means for suitable terminating or tuning a concentric line.

The invention will be more readily understood by reference to the accompanying drawing which illustrates a sectional view of a preferred form of the invention.

Referring to the drawing, the piston is constructed from two concentric tubes 1, 2, the outer tube 1 being a sliding fit inside the outer conductor of the concentric line and the tube 2 being slidable on the outside of the inner conductor of the line. One end of each tube is slit to form contact fingers 3 to ensure good electrical contact with the line conductors. The inner tube 2 has an integral external flange 4 which is of smaller diameter than the outer tube 1 so as to be spaced therefrom at its periphery, and the outer tube 1 has an integral inner flange 5 having an aperture through which the tube 2 extends without touching the flange 5. A layer of insulating material 6, such as mica, separates the flanges 4 and 5. The condenser is built

up from a plurality of annular discs 7, 8, of conducting material (e.g. copper), the discs 7 being of an outer diameter such that they are a tight fit in the tube 1 and the central apertures of the discs 7 are large enough to avoid contact with the inner tube 2, while the alternate condenser discs 8 have central holes such that they are a tight fit on the inner tube 2 and the outer diameters of the discs 8 are smaller than the interior diameter of the tube 1 so as to avoid contact therewith. The condenser discs 7 and 8 are separated by interposed discs 9 of insulation such as mica. The condenser assembly is pressed tightly between the flange 5 and an end block 10 with a layer of insulation 11 between the end block and the condenser assembly. The end block 10 is held in place to clamp the condenser assembly by splaying the end of the inner tube 2 into the tapering central hole of the end block at indicated at 12. The condenser can be built up to the required value of capacity by adding conducting and insulating discs one by one until measurements show that the required capacity has been obtained.

The effect of terminating a concentric line by a piston constructed in the manner above described is to seal the line against the passage, past the condenser, of ultra-high-frequency energy but to permit the passage through the inner conductor of leads carrying direct or low-frequency current, such as that required for operating a valve heater.

Dated this 11th day of September, 1944.

W. E. GOSS,

Acting for the Applicants.

COMPLETE SPECIFICATION

Means for Terminating or Tuning a Concentric Electrical Line

We, ROBERT BULLOCH PHILLIPS, of Admiralty Signal Establishment Extension, Wills Physics Laboratory, Royal Fort, Bristol, 8, and CHARLES SEYMOUR WRIGHT, C.B., O.B.E., M.C., M.A., Director of Scientific Research, Admiralty, London, S.W.1, both of British Nationality, do hereby declare

the nature of this invention and in what manner the same is to be performed, to be particularly described and ascertained in and by the following statement:—

This invention relates to concentric or coaxial lines for the transmission of ultra-high-frequency electromagnetic energy and one object of the invention is

to provide means for suitably terminating or tuning a coaxial line.

The usual terminating closure of one end of a coaxial line is by means of a metal piston fitting closely into the annular space between the exterior of the inner line conductor and the interior of the outer line conductor and short-circuiting the line but at very high frequencies the ordinary piston closure has been found to be unsatisfactory. A more effective closure at very high frequencies can be obtained by terminating the line with a capacitor of correct value which acts as an effective short circuit. A further object of the invention is to provide an improved construction of closure incorporating such a capacitor.

According to the invention a capacitative terminating or tuning unit for a coaxial line comprises an outer metal tube contacting the inside surface of the outer line conductor and an inner metal tube contacting the surface of the inner line conductor, said tubes being spaced apart and maintained in coaxial alignment by insulating washers which are disposed between overlapping metal collars projecting from the inside of the outer tube towards the inner tube and from the inner tube towards the outer tube and constituting the plates of a condenser of which the insulating washers form the dielectric.

The collars may be integral with the tubes (i.e. in the form of flanges on the tubes) or may consist of metal discs with central apertures so that alternate discs respectively fit tightly on the inner tube clear of the outer tube or tightly inside the outer tube clear of the inner tube with said insulating washers interposed between adjacent discs.

A constructional example of a terminating or tuning unit according to the invention is illustrated in sectional view in the drawing accompanying the Provisional Specification.

Referring to the drawing, the unit is constructed from two concentric tubes 1 and 2, the outer tube being a sliding fit inside the outer conductor of the coaxial line and the tube 2 being slidable on the outside of the inner conductor of the line. One end of each tube 1, 2 is slit and bent as shown to form springy fingers 3 to ensure good electrical contact with the line conductors. The inner tube 2 has an integral external collar or flange 4 which projects towards the outer tube 1 but is of smaller diameter than the interior of the outer tube 1 so as to be spaced therefrom at its periphery as shown in the drawing, and the outer tube 1 has an integral collar or flange 5 projecting

inwardly towards tube 2 and having a central aperture through which the tube 2 extends without touching the flange 5. A washer 6 of insulating material, such as mica, separates the flanges 4 and 5 and maintains the tubes 1, 2 in coaxial alignment. The collars 4 and 5 with the insulating washer 6 constitute a capacitor between the tubes 1, 2. Additional capacitance is provided by a similarly constructed condenser located in the cavity between the outer and inner tubes 1 and 2 from the flange 5 to the ends of the tubes and built up from a plurality of collars 7, 8 of conducting material (e.g. copper), the collars 7 being of an outer diameter such that they are a tight fit at their peripheries in the interior of the tube 1 and the central apertures of the collars 7 are large enough to avoid contact with the inner tube 2, while the alternate collars 8 have central holes of such size that the collars 8 are a tight fit on the inner tube 2 and the outer diameter of each collar 8 is smaller than the interior diameter of the tube 1 so as to avoid contact therewith. The collars 7 and 8 are separated by interposed washers of insulating material, such as mica, which also help to maintain the tubes 1, 2, in alignment. The additional condenser assembly is pressed tightly between the flange 5 and an end block 10 with an insulating washer 11 between the end block 10 and the condenser assembly and the washer 11 also aids in aligning the tubes. The end block 10 practically fills the open end of the cavity in which the additional condenser assembly is located but does not touch the outer tube 1 and is held in place to clamp the condenser assembly by splaying the end of the inner tube 2 into the tapering central hole of the end block as indicated at 12. The condenser can be built up to the required value of capacity by adding appropriate conducting and insulating discs one by one until measurements show that the required capacity has been obtained.

The tubes 1, 2 are not in electrical contact with one another and so do not form a physical short-circuit to the line, although the effect of terminating a coaxial line by a unit constructed in the manner above described is to prevent the propagation past the condenser of ultra-high-frequency energy and thus to close the end of the line. The condenser structure is such as to permit the passage through the hollow inner line conductor of leads carrying direct or low-frequency current such as that required for operating a valve heater.

Having now particularly described and

ascertained the nature of our said invention, and in what manner the same is to be performed, we declare that what we claim is:—

- 5 1. A capacitative terminating or tuning unit for a coaxial line, comprising an outer metal tube contacting the inside surface of the outer line conductor and an inner metal tube contacting the surface of the inner line conductor, said tubes being spaced apart and maintained in coaxial alignment by insulating washers which are disposed between overlapping metal collars projecting from the inside of the outer tube towards the inner tube and from the inner tube towards the outer tube and constituting the plates of a con-

denser of which the insulating washers form the dielectric.

2. A unit according to Claim 1, wherein the collars consist of metal washers fitting tightly on the inner tube clear of the outer tube combined with others fitting tightly inside the outer tube clear of the inner tube. 20 25

3. A capacitative terminating or tuning unit as hereinbefore described with reference to the drawing accompanying the Provisional Specification.

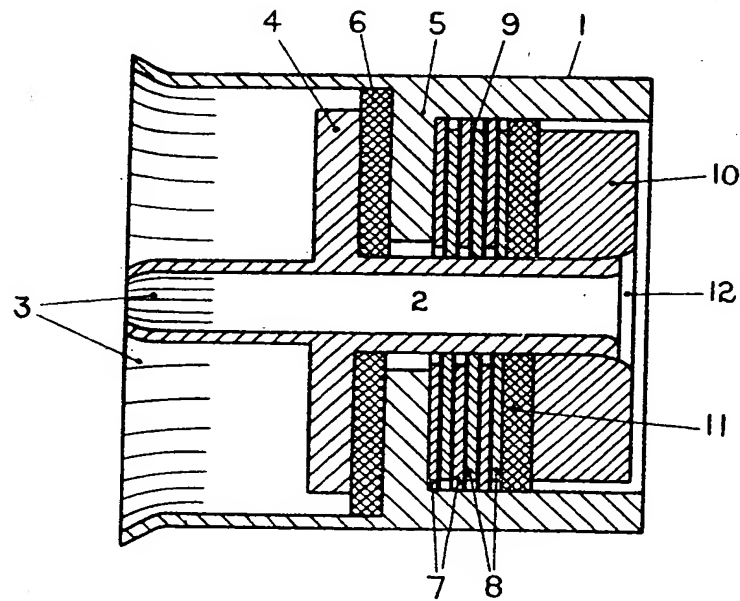
Dated this 17th day of February, 1947.

W. E. GOSS,
Chartered Patent Agent,
For the Applicants.

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[This Drawing is a reproduction of the Original on a reduced scale.]



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